

grease to the branch below the nest to discourage snakes climbing up and was rewarded in each case by seeing the young leave their nests!

*Echis* is active during the rains and it is then that it will readily climb up trees. Reading Whitaker's note I gained the impression that the snake goes into trees, possibly to evade water-logging. This would certainly not be the case in the hilly ground where I have come to know this viper. Of course, I am no expert but an interest in, and some knowledge of, this snake has been a bonus from my interest in birds.

My attention has been drawn by the Society's Librarian, Mr. J. S. Serrao, to an article entitled "The Wild Plantain (*Musa superba* Roxb.), by G. M. Ryan (*J. Bombay nat. Hist. Soc.* Vol. 15: 589, 1904), where the

author writes: 'It perhaps may be interesting to mention here parenthetically that near the end of the rainy season the Foorsa (*Echis carinata*) finds a resting place between the leaf-stalks of the wild plantain leaves in the erstwhile Bombay area. An editorial footnote appended to this sentence reads: "He is also fond of inhabiting the branches of the 'apta' (*Bauhinia racemosa*)".

Commenting on my note Romulus Whitaker to whom it was sent for an opinion, says "terrestrial snakes are tolerant of water and wet ground to some extent but even the larger ones like the cobra and rat snake become more arboreal in habit during the rains. Soaking for too long and extra long contact with substratum below normal, optimum temperature (i.e. from wetness) may lead to respiratory ailments and digestion problems in snakes."

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## 20. OBSERVATIONS ON THE STRUCTURE OF THE HEMIPENIS IN SOME INDIAN SNAKES (With four text-figures)

A detailed study of the systematic characteristics of the hemipenis of four Indian snakes *Eryx conicus*, *Lycodon striatus*, *Naja naja*, and *Echis carinatus* was undertaken. In the snakes studied their active reproductive phase facilitated quicker eversion of the hemipenis than that of inactive condition.

### INTRODUCTION

The external genital structures of snakes, called hemipenis, vary with species in morphological details. Cope (1898) was the first to draw attention to the possibility of taxono-

mic classification of species based upon the structure of the hemipenis. The paper on basic structure of the snake hemipenis by Dowling and Savage (1960) has been particularly important.

The anatomy of the hemipenis of the Indian snakes has received little attention except for the observations of Smith (1943), McCann (1946) and Sabnis (1969). The observations of Smith (1943) were based on "... poorly preserved material mostly *in situ*," whereas McCann (1946) has described the external genitalia of some reptiles in

everted condition. Sabnis (1969) has described the gross anatomy and histology of the hemipenis of *Xenochrophis picator piscator*. The present study was undertaken in order to contribute further information to the structure of the hemipenis in some Indian snakes in the light of new method of description suggested by Dowling and Savage (1960).

#### MATERIAL AND METHODS

This study is based on the examination of ten specimens each of the following species:  
Ophidia: Family—

BOIDAE: *Eryx conicus*

COLUBRIDAE: *Lycodon striatus*

ELAPIDAE: *Naja naja*

VIPERIDAE: *Echis carinatus*

The specimens were collected in the vicinity of Amravati. In all cases everted external genitalia preparations were made from freshly killed specimens after cutting *retractor penis magnus* and injecting fluid into blood sinus. The fully everted external genitalia were measured against the scales beneath the tail. They were fixed in alcoholic Bouin's fluid and preserved in 70 per cent alcohol.

#### OBSERVATIONS

The hemipenis of *Eryx conicus* is bilobed and extends up to the sixth sub-caudal. The pedicel is short. In a snake measuring 32.5 cms in length, the hemipenis measures 8 mm in length and 4 mm in breadth. The hemipenis is of the flounced type having transverse scalloped flounces (Fig. 1). The basal region of the pedicel is nude. The margins of the sulcus are clearly marked by fleshy lips. It is bifurcate. The sulcus forks at the level of the fourth sub-caudal and the branches run onto the lobes.

In *Lycodon striatus* the bilobed hemipenis

which extends up to the 10th sub-caudal, is blunt and each lobe ends in a spherical head. The pedicel is long. In a snake measuring 60.5 cms, the hemipenis measures 21 mm in length and 6 mm in breadth. The distal one-third part of the head is calyculate-spinulate with four spines on the margin of each calyx. The remainder of the organ has longitudinal folds which are beset with distinct spines. Starting from the calyculate region and extending about half way down the pedicel are prominent folds composed of short fleshy papillae (Fig. 4). The sulcus has a shallow groove which bifurcates at the 6th sub-caudal.

In *Naja naja* the bilobed hemipenis extends up to the 12th sub-caudal in fully everted condition and is forked against 8th sub-caudal. The pedicel is 35 mm long in a snake measuring 135 cms. The head is distinctly divided into three regions which are fairly defined from one another: an apical with minute spines, a middle with large bulbus area containing 44 large spines on either side of the sulcus, and next to this is an area of small spines (Fig. 3). The apical area between the minute spines is smooth. The sulcus is shallow, forked at the bulbus area of the head and bifurcates against the 7th sub-caudal.

The hemipenis of *Echis carinatus* in fully everted condition is bilobed. In snake measuring 64.5 cms, the organ measures 16 mm in length and 9 mm in breadth. It extends up to 10th sub-caudal. It is proximally spinose and distally calyculate. The spinose area extends up to the proximal two-third part of the hemipeneal pedicel and remaining distal one-third bilobed part is calyculate-spinulate with four to five uniform spines on the margin of each calyx (Fig. 2). The pedicel is nude at the base. The sulcus spermaticus is forked and it forks on the shaft with a branch onto each lobe.

The hemipenis everted easily on application of slight pressure to the caudal region in snakes with active testis (*Naja* and *Eryx*), while considerable effort was required to evert penis in snakes with inactive testis (*Lycodon*

although they show taxonomic variations in their structure. As in *Epicrates angulifer* (Dowling & Savage 1960), *Xenochrophis piscator* (Sabnis 1969) and *Python molurus* (McCann 1946) the hemipenis is bilobed in *Eryx conicus*, *Lycodon striatus*, *Naja naja* and *Echis carinatus*, although Smith (1943) described the hemipenis of *Eryx conicus* as not forked. A distinct bilobed condition occurs in everted hemipenis of *Echis carinatus* though earlier it has been described as bifurcate type by Smith (1943) who described the organ *in situ*.

The ornamentation of hemipenis in *Eryx conicus* is scalloped flounced type but Smith (1943) has described the flounces as joining distally to form large cups. The hemipenis of *Python molurus* (McCann 1946) is calyculate as in *Loxocemus bicolor*, *Masticophis flagellum*, and *Opheodrys aestivus* (Dowling & Savage 1960), but it is flounced in *Epicrates angulifer* (Dowling & Savage 1960). In *Lycodon striatus* and *Echis carinatus* it is spinose calyculate type but Smith (1943) and Vad (1959) described it as spinose in the latter species. Dowling & Savage (1960) observed spinulate calyces in *Spalerosophis diadema*. In *Xenochrophis piscator piscator* the apical region of the hemipenis is spinose (Smith 1943, McCann 1946 and Sabnis 1969) but it is without ornamentation or nude in *Natrix sipedon* (Dowling & Savage 1960).

The sulcus spermaticus in *Eryx conicus*, *Lycodon striatus* and *Echis carinatus* is bifurcate as in Boids and Viperids.

As no detailed information on the structure of hemipenis of many common Indian snakes is available, the above observations and diagrammatic representations will certainly aid in future taxonomic study of Indian snakes based on hemipenis structure.

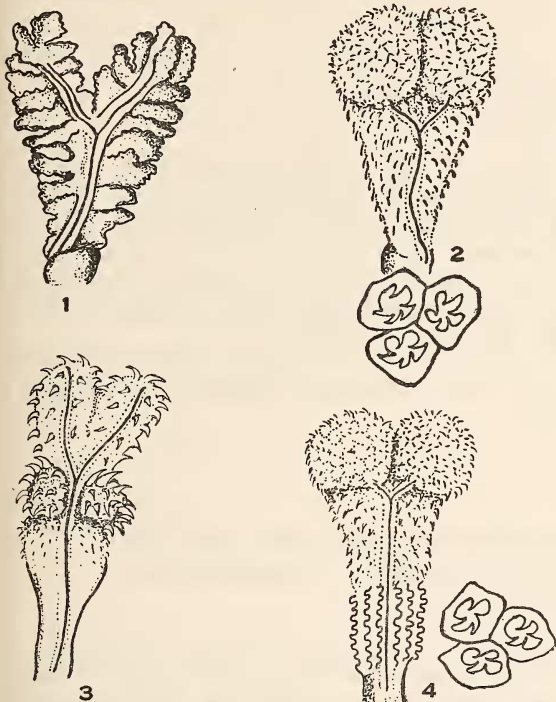


Fig. 1. Diagrammatic representation of the everted aspect of the hemipenis of *Eryx conicus*, showing scalloped flounces. Fig. 2. The bilobed hemipenis of *Echis carinatus* with spinulate calyces having 4 to 5 spines. Figs. 3 & 4. The everted aspect of hemipenis of *Naja naja* and *Lycodon striatus*.

and *Echis*). This leads to the conclusion that active reproductive state helps in easy eversion of the organ.

#### DISCUSSION

The gross anatomical relationship of the hemipenis in Ophidia seems fairly constant



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21. NEW LOCALITY RECORD WITH REMARKS ON THE TUCKTOO LIZARD, *GEKKO GECKO* (LINNAEUS) [SAURIA: GEKKONIDAE] FROM TRIPURA

Ten species of the genus *Gekko* Laurenti, 1768, have so far been described, out of which only two species namely, *Gekko gecko* (Linnaeus) and *Gekko smithi* Gray, are known within the Indian limits. According to Smith (1935) the former is distributed through the whole of Indo-Chinese subregion, North-Eastern India (Bengal, Bihar), Burma, Thailand, Taiwan, Andaman Islands and the East-Indian Archipelago; and the latter is found in the Andaman Islands, Java, Malay Peninsula and the Malay Archipelago. Annandale (1907) attributed the occurrence of *G. gecko* in West Bengal, to accidental introduction and such is likely the case in the state of Bihar also. Very recently, Pillai & Talukdar (1973)

recorded the occurrence of this species from the Assam Region which fits well with the Indo-Chinese and Malayasian zoogeographical distribution.

While studying the reptile collection brought from Tripura during the year 1972-73 by Dr V. C. Agrawal, I came across a gekkonid lizard which proved to be *Gekko gecko* (Linnaeus). The occurrence in Tripura, bridges the distribution gap between Burma-Malaya and India.

A detailed examination of all the specimens of this species present in the Zoological Survey of India collection reveals that the species occurs in Dacca and Chittagong Hill tracts of Bangladesh and also in Kohphai Is-